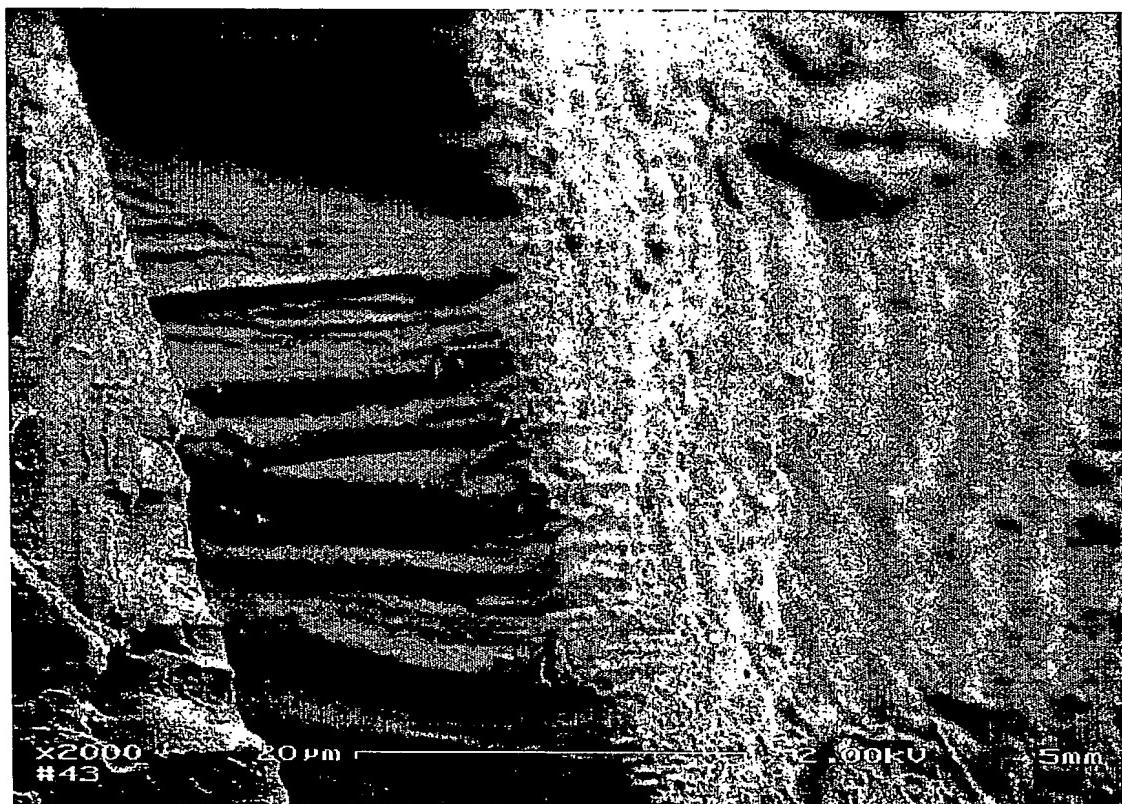


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Figure 1



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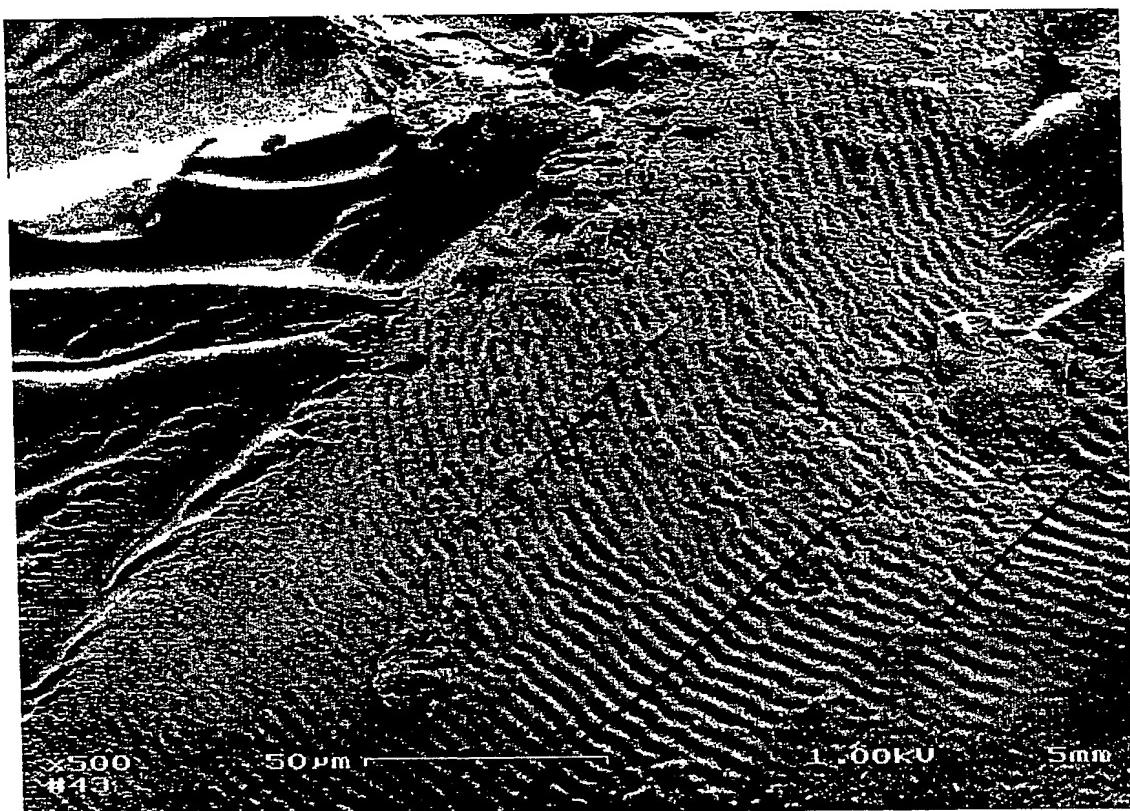
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Figure 2



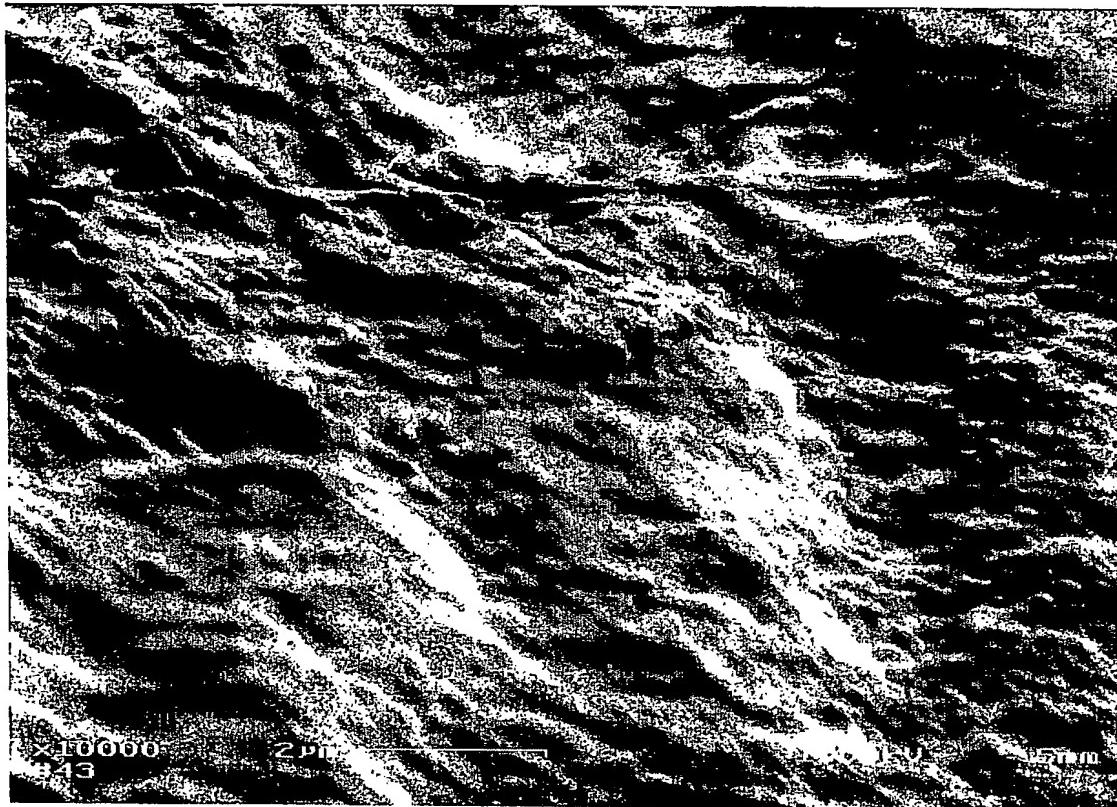
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Figure 3



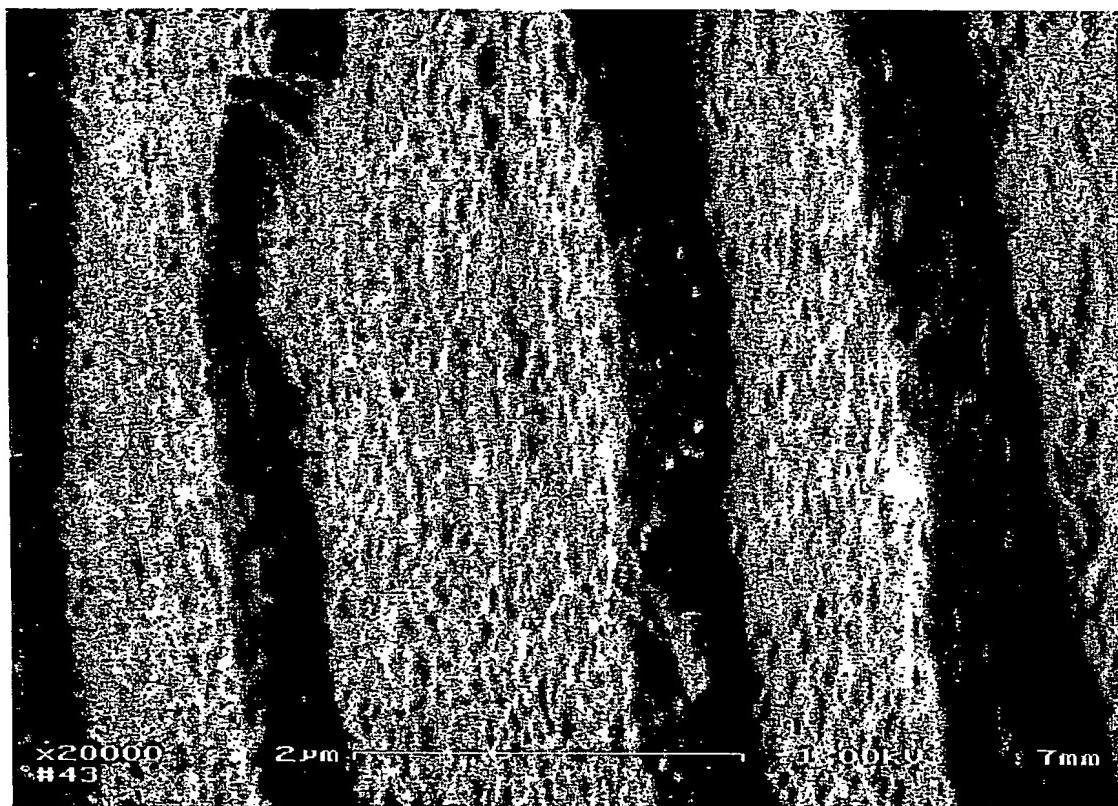
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**Figure 4**



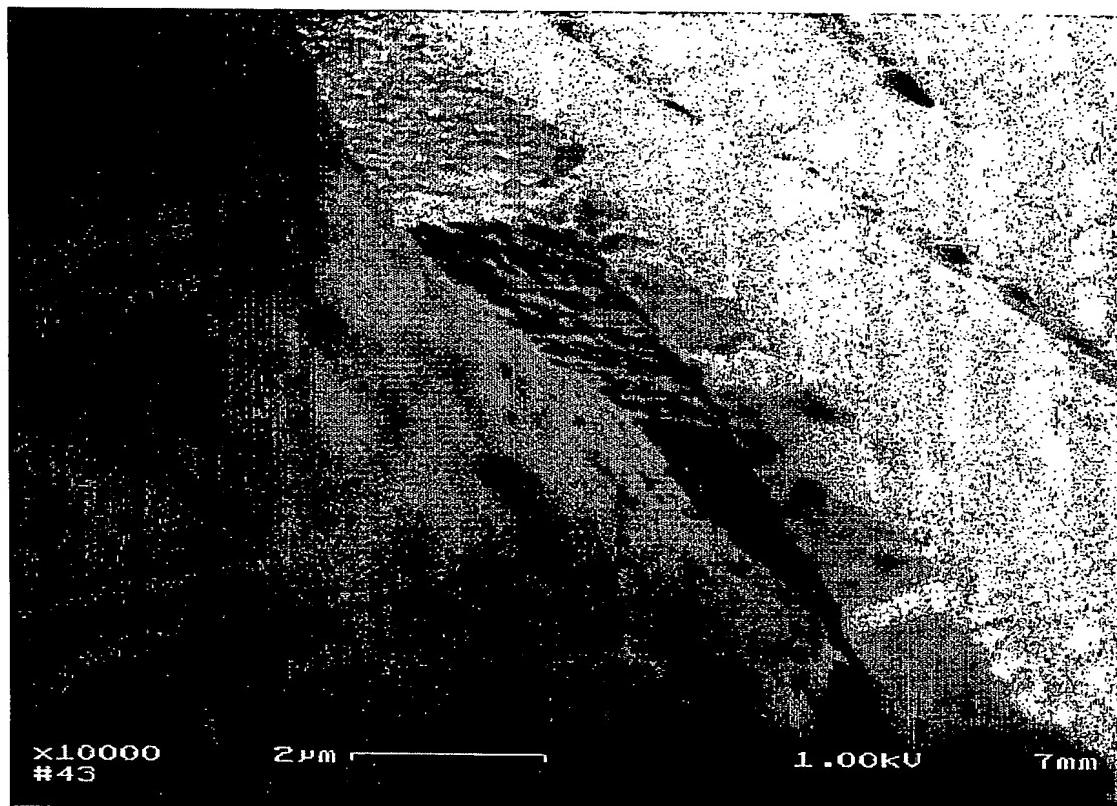
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Figure 5



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**Figure 6**



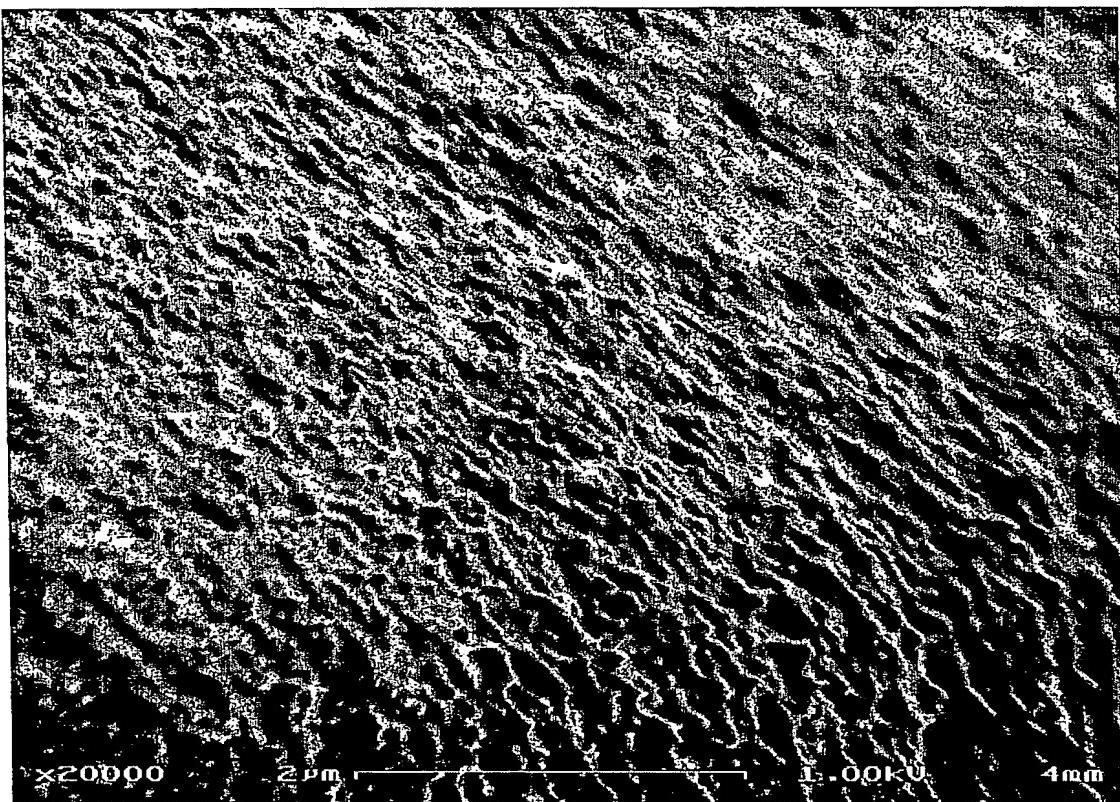
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**Figure 7**



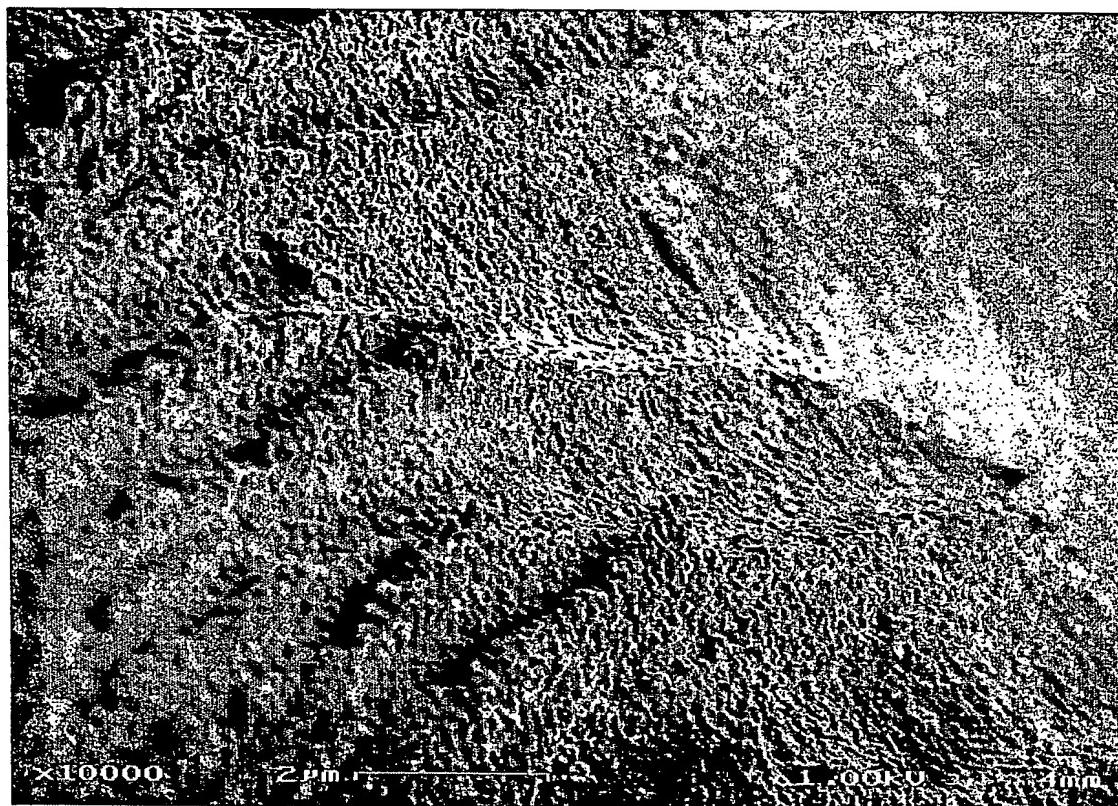
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**Figure 8**



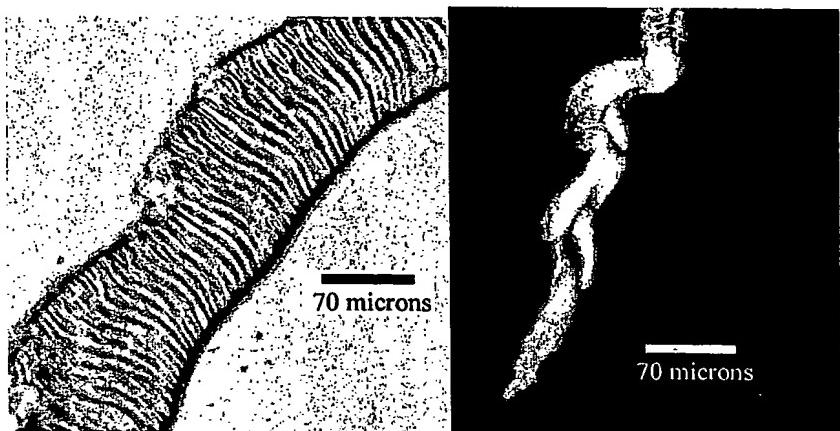
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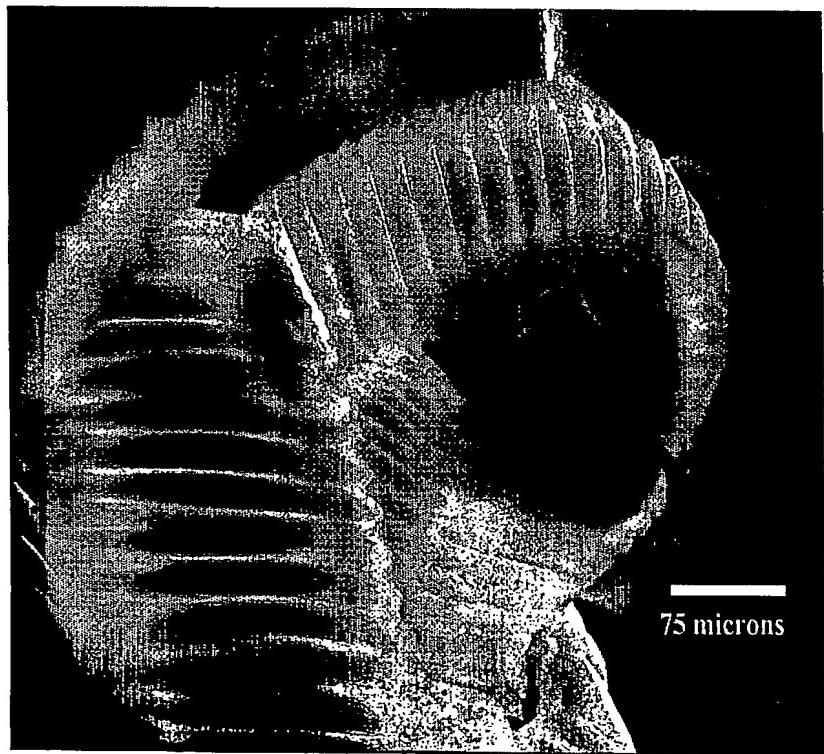
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**Figure 9**



1

2



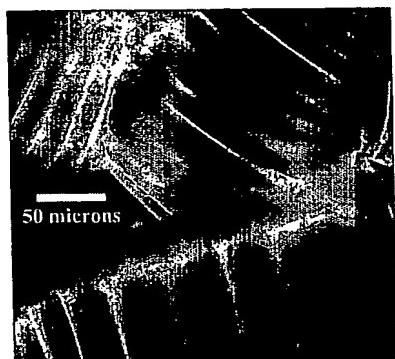
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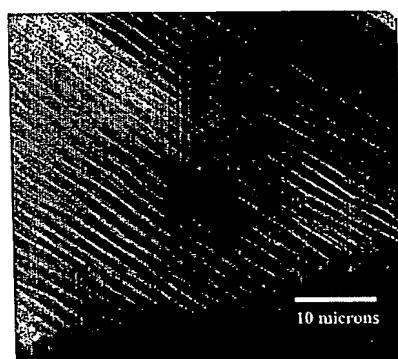
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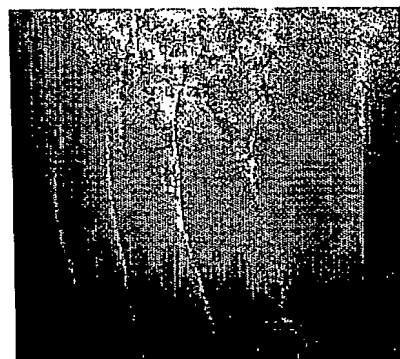
**Figure 10**



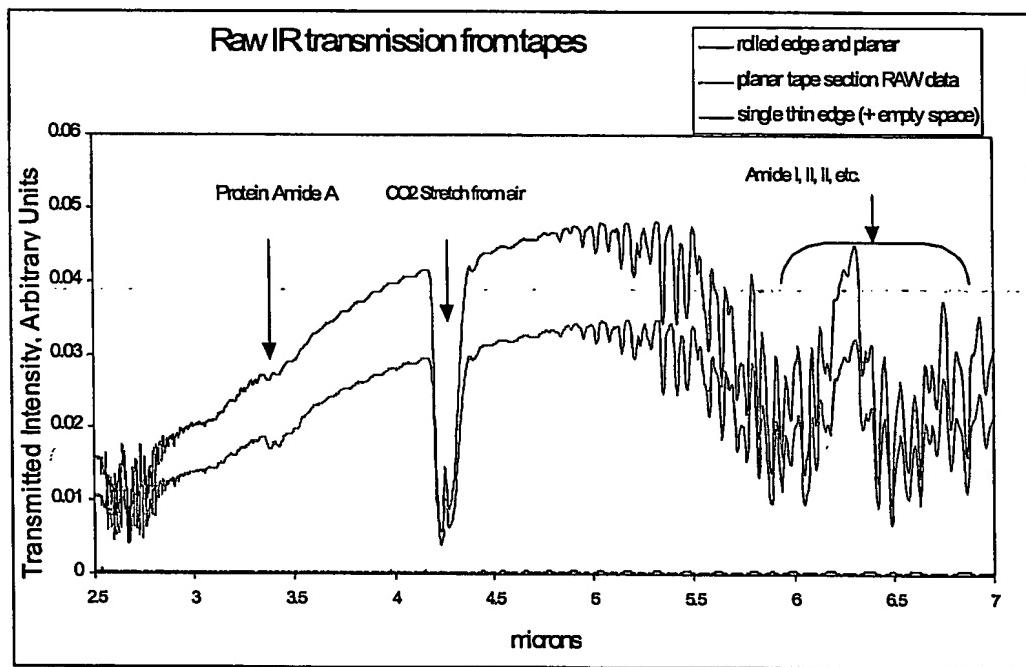
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2



3

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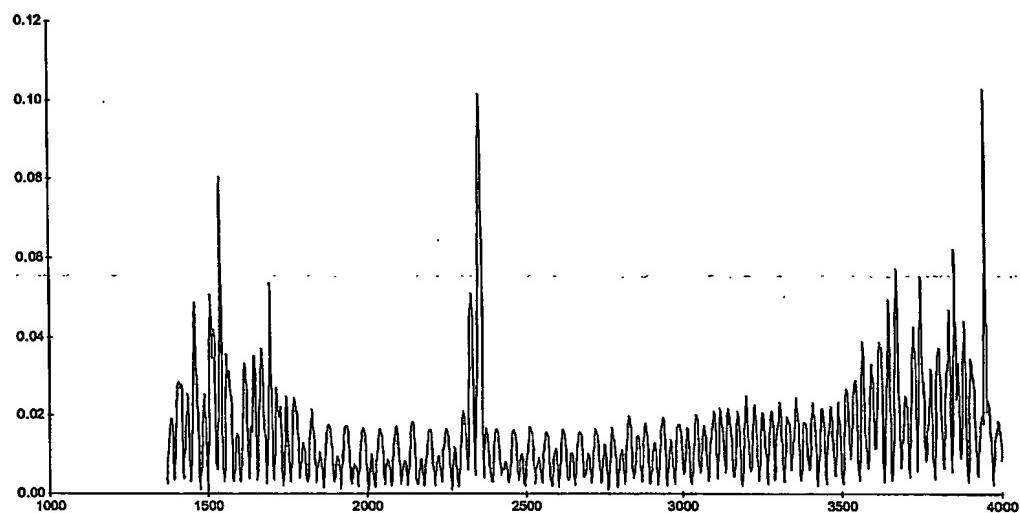
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**Figure 12**



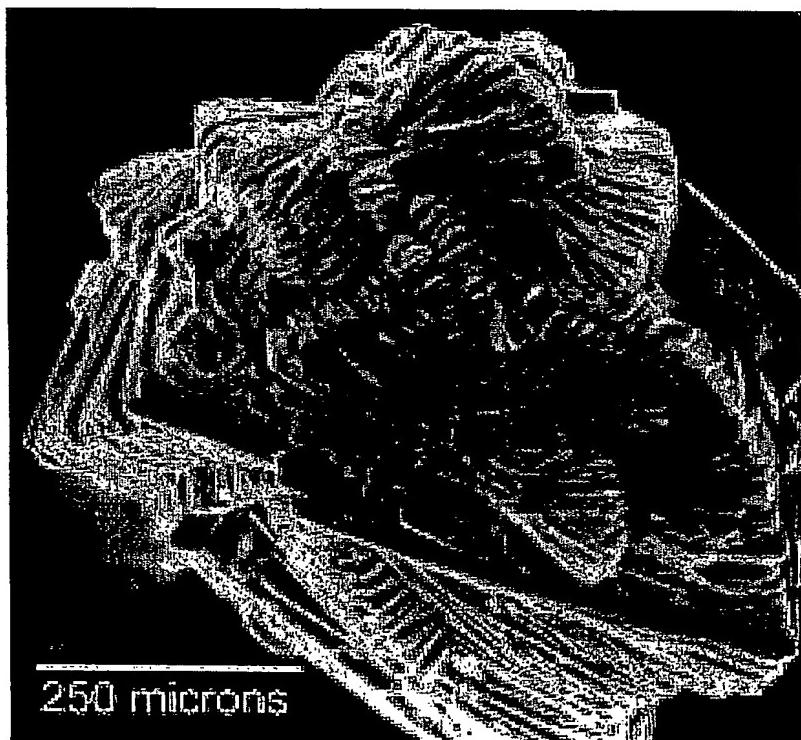
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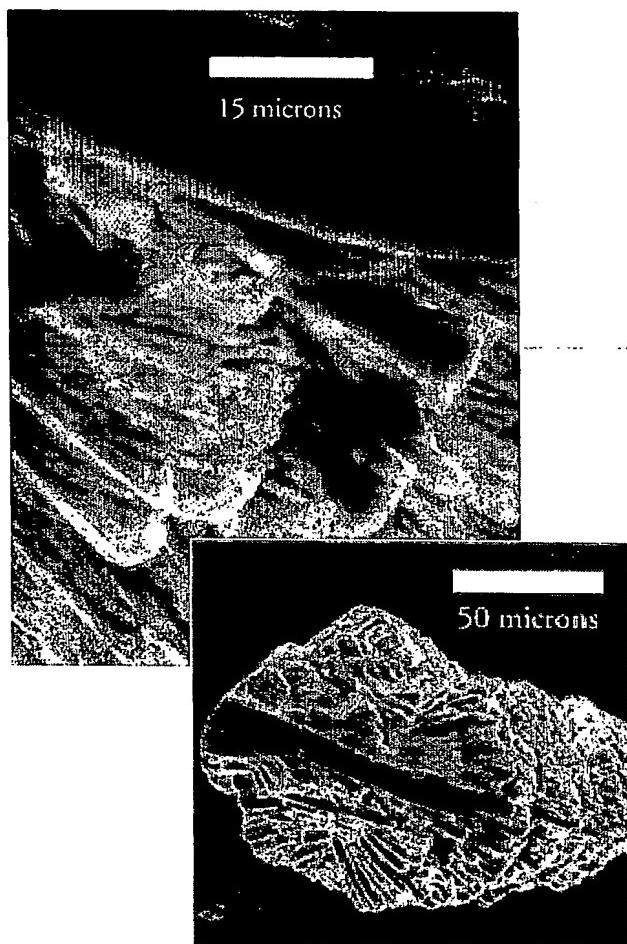
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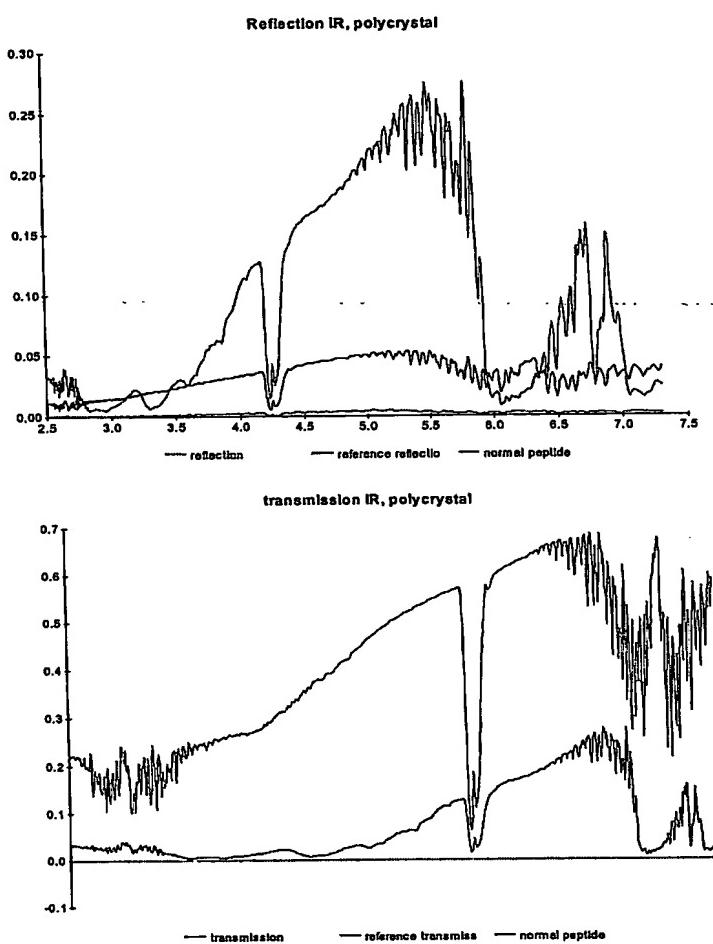
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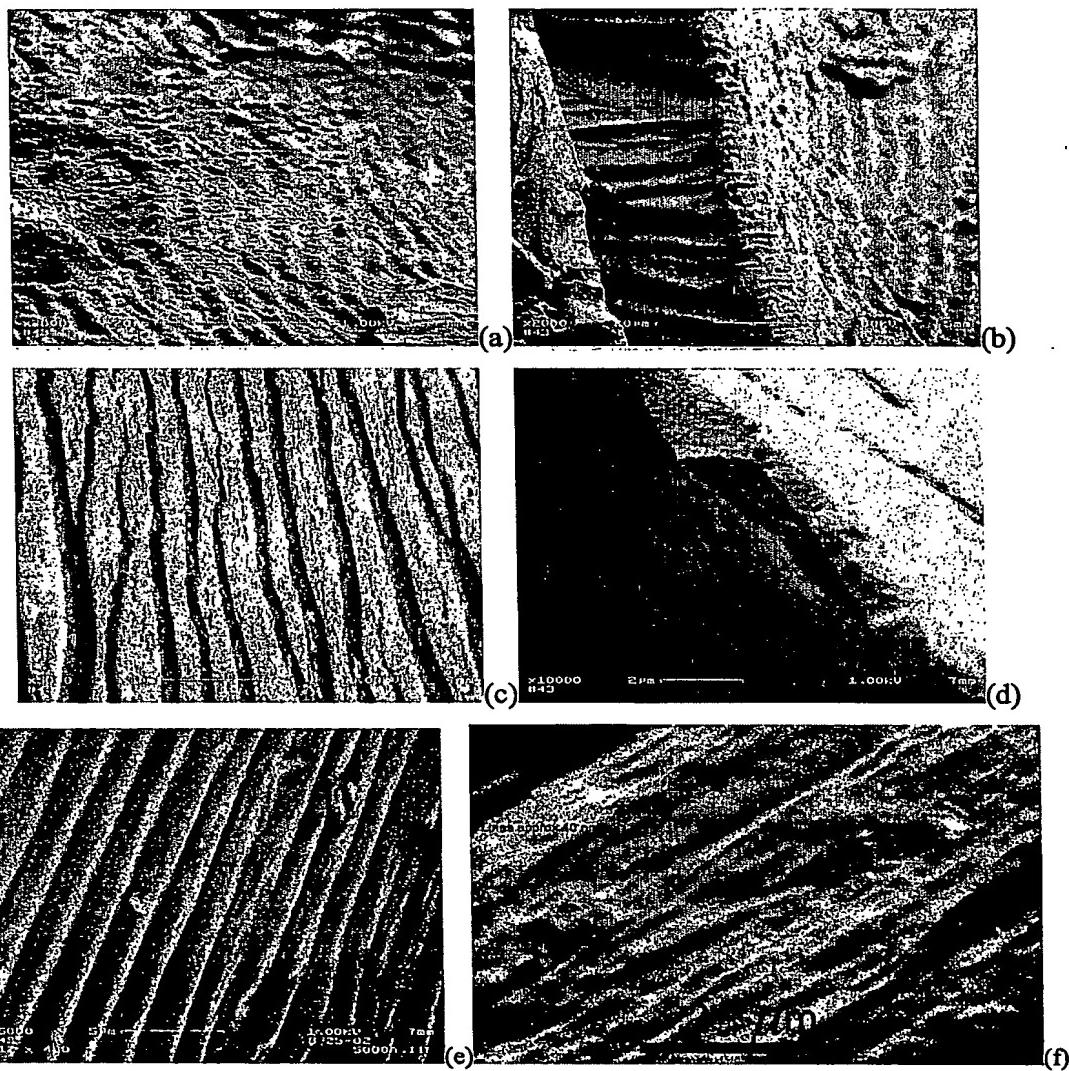
**Figure 13**



**Figure 14**



**Figure 15**

**Figure 16**

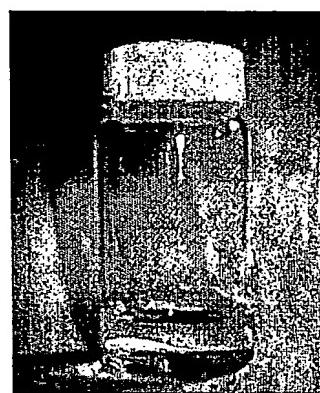
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**Figure 17**



**Figure 18**



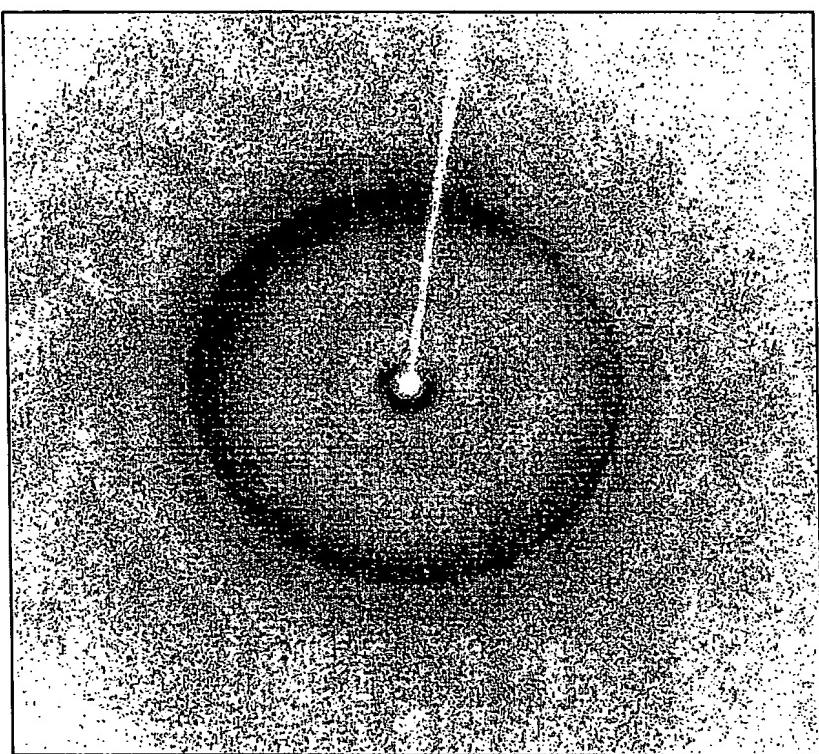
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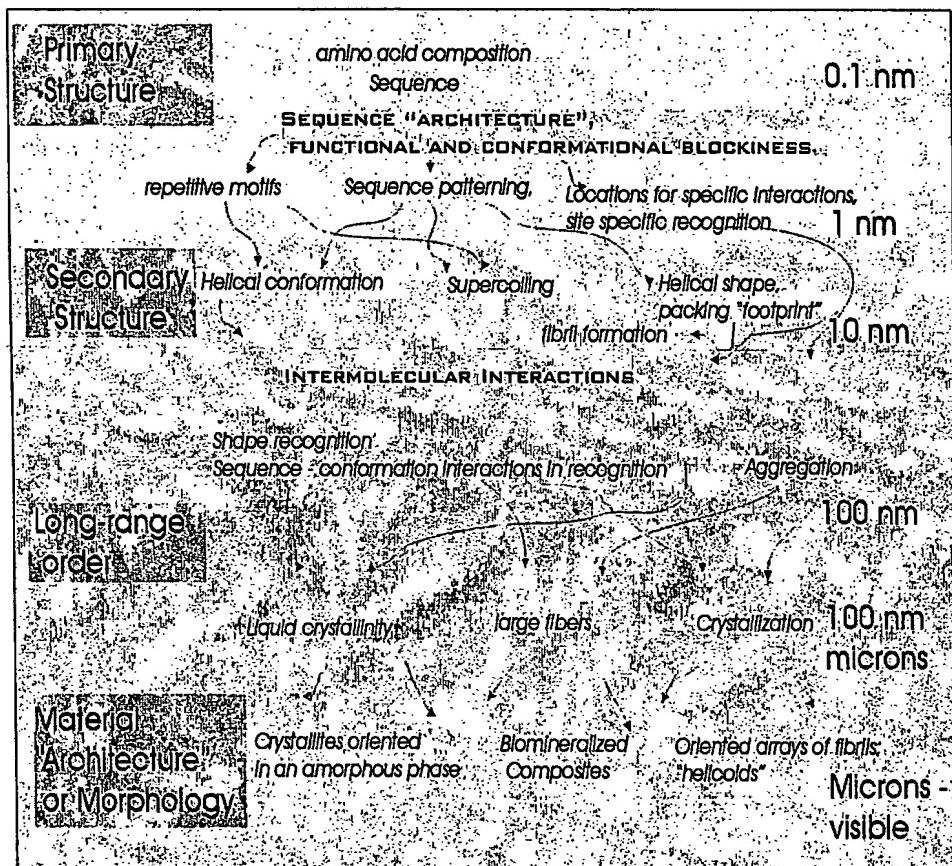
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**Figure 19**



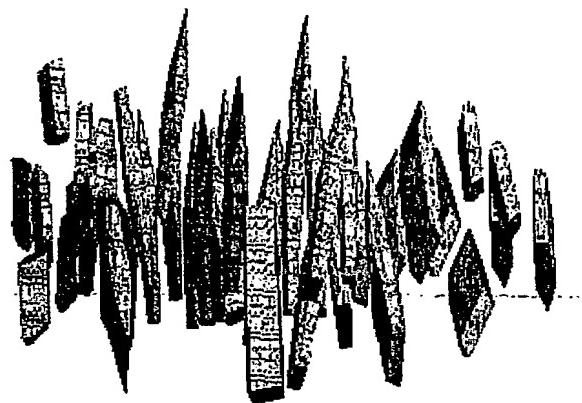
**Figure 20**

- Long homogeneous helical domains
- Not necessarily “folded”
- Polymorphic secondary structure
- Material formed by mesophase
- Structural role
- Extended fibers or fibrils
  - similar to synthetic polymers
  - can be polycrystalline, mineralized

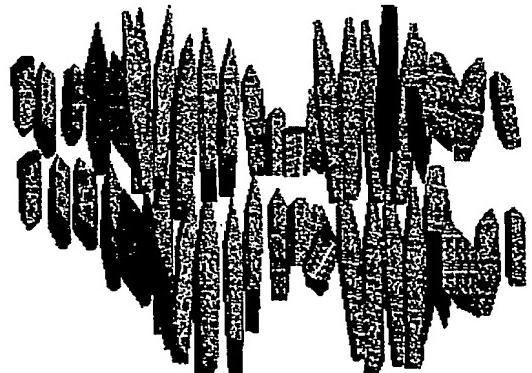
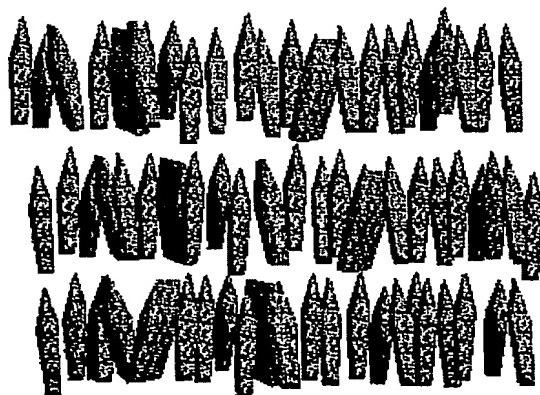
**Figure 21**

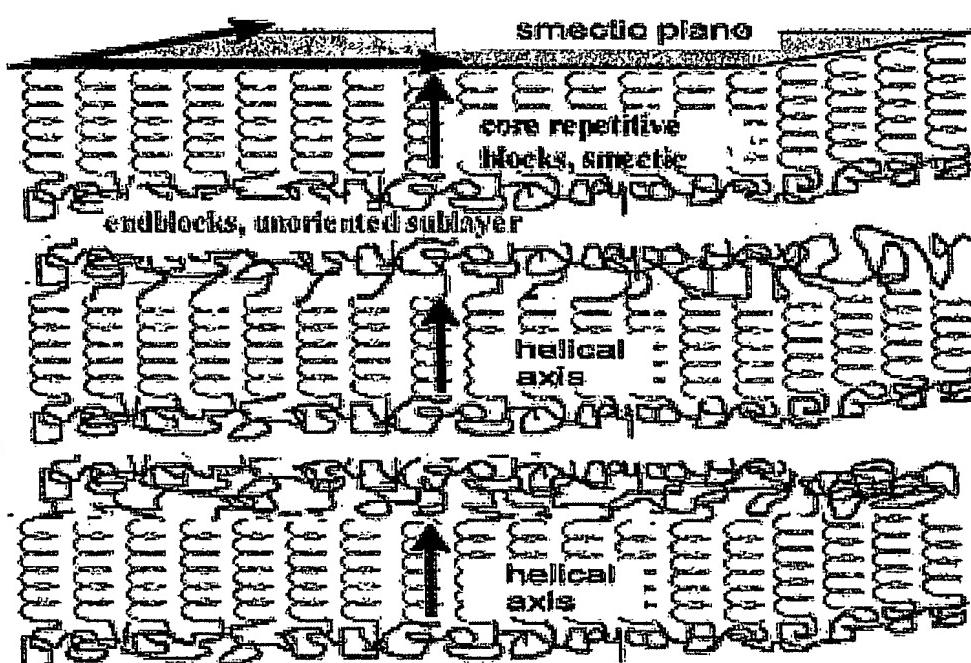
- “Liquid Crystal”
- Molecules anisotropic
- orientation, possibly some position

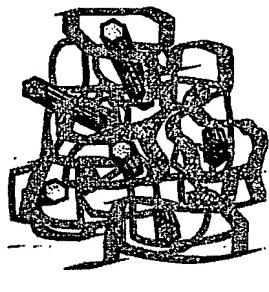
Chiral one dimensional liquid crystal



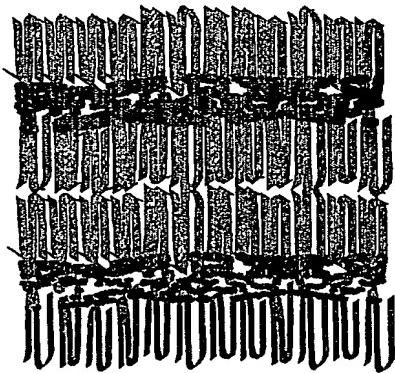
Two dimensional liquid crystals



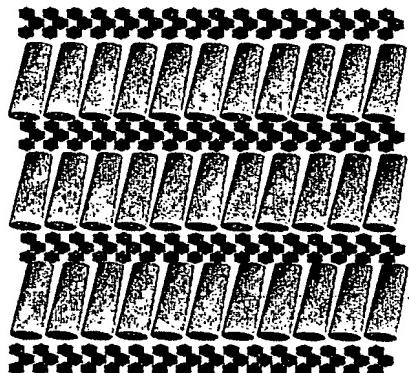
**Figure 22**

**Figure 23**

1. Nanocomposite - nanodomains of one phase separated by nanoscale domains of a second phase

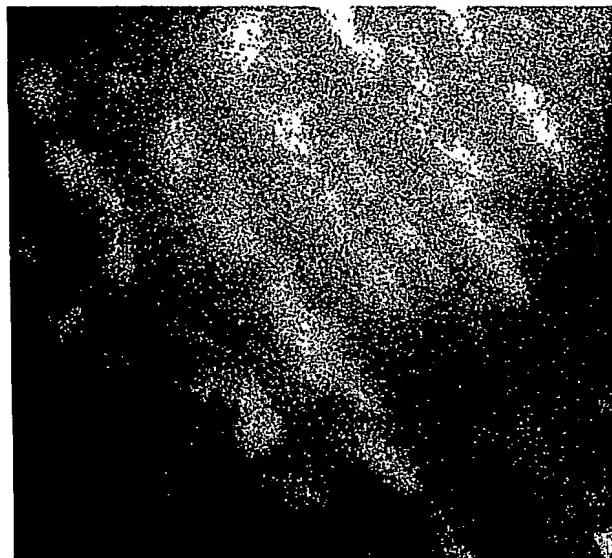
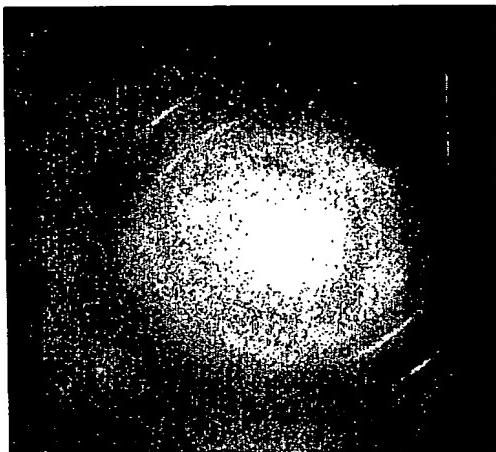
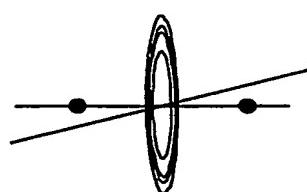


2. Simple Patterned Nanocomposite (from smectic layers)



3. "Cocrystal" - peptide phase crystallizes and/or inorganic phase crystallizes within layers

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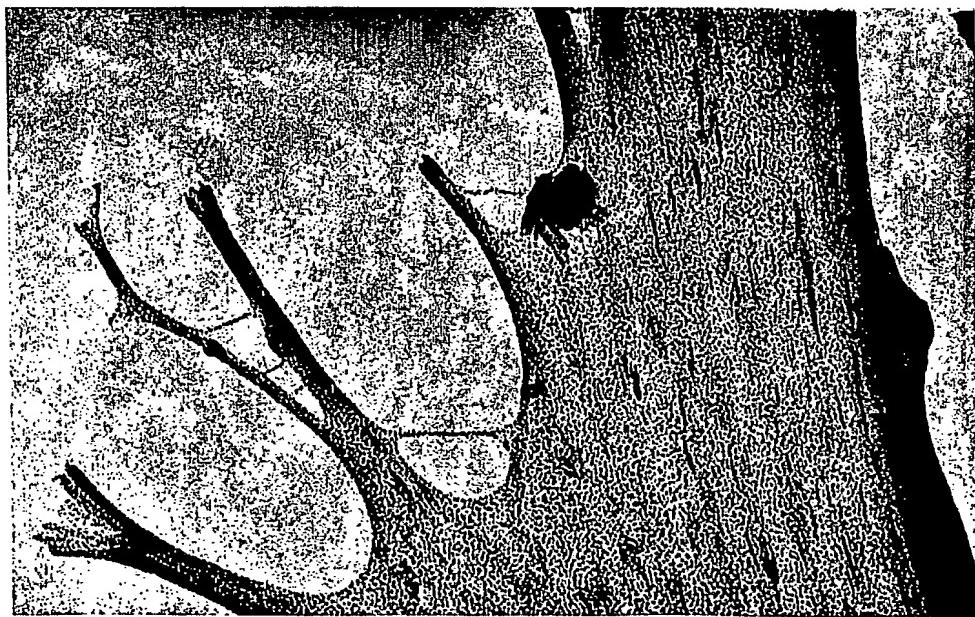
**Figure 24****Silkworm****Reciprocal Lattice for Cholesteric Film****Cholesteric Diffraction Pattern Expected**

**Figure 25**

Peptide (GAGAGS) core

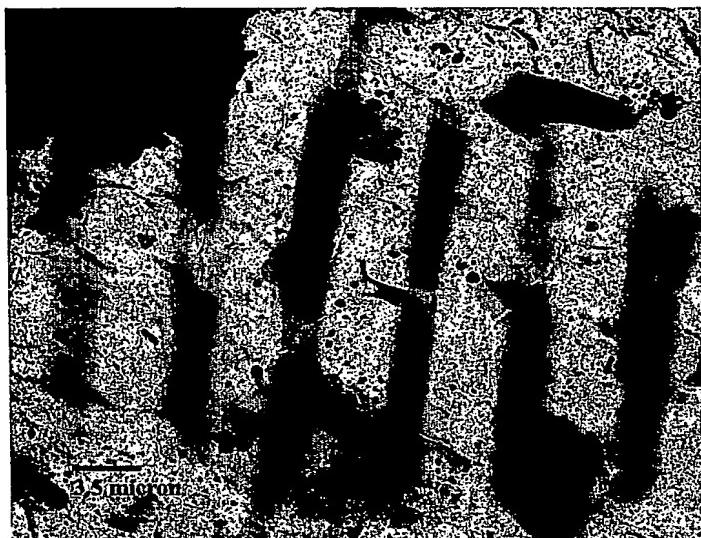


Met triggered Spider silk (biosynthetic)

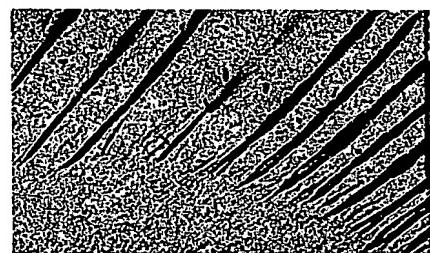


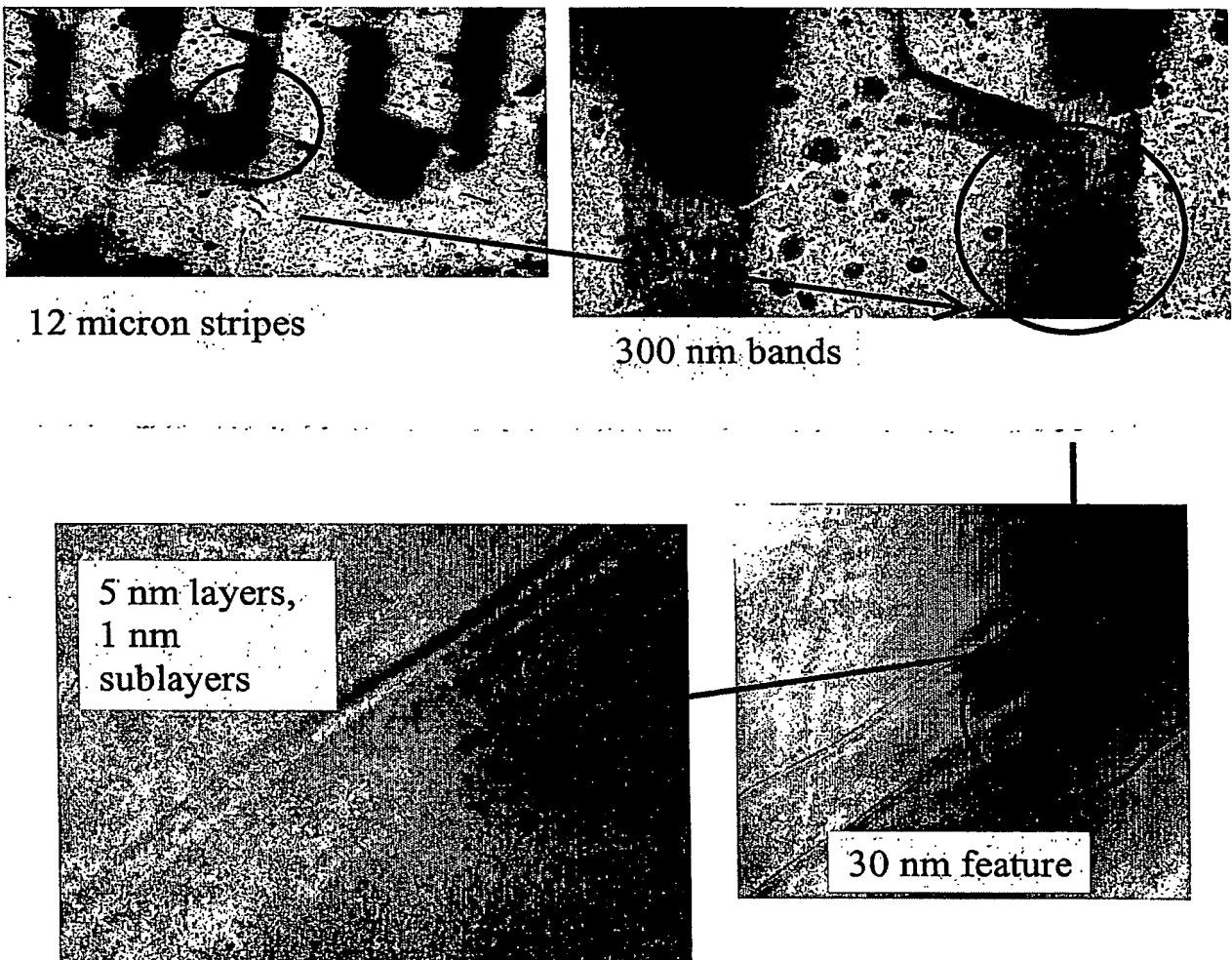
**Figure 26**

Peptides



Native Proteins (silks)



**Figure 27**

Air water interface from  
EDTA-Na aqueous solution of  
 $(\text{Glu})_5(\text{Gly}-\text{Asp}-\text{Val}-\text{Gly}-\text{Gly}-$   
 $\text{Ala}-\text{Gly}-\text{Ala}-\text{Thr}-\text{Gly}-\text{Gly}-$   
 $\text{Ser})_2(\text{Glu})_5$

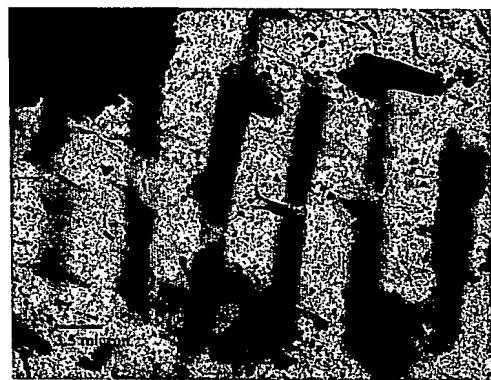
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**Figure 28**



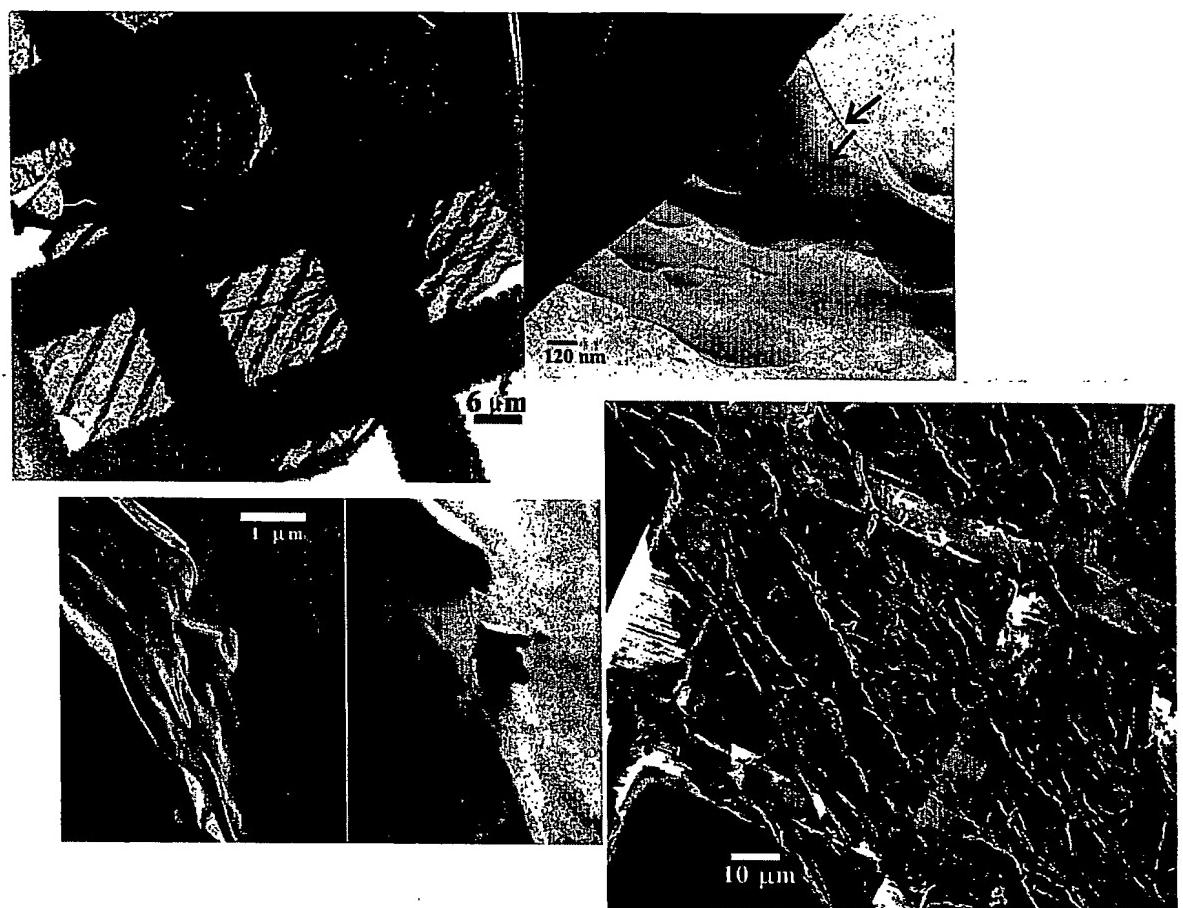
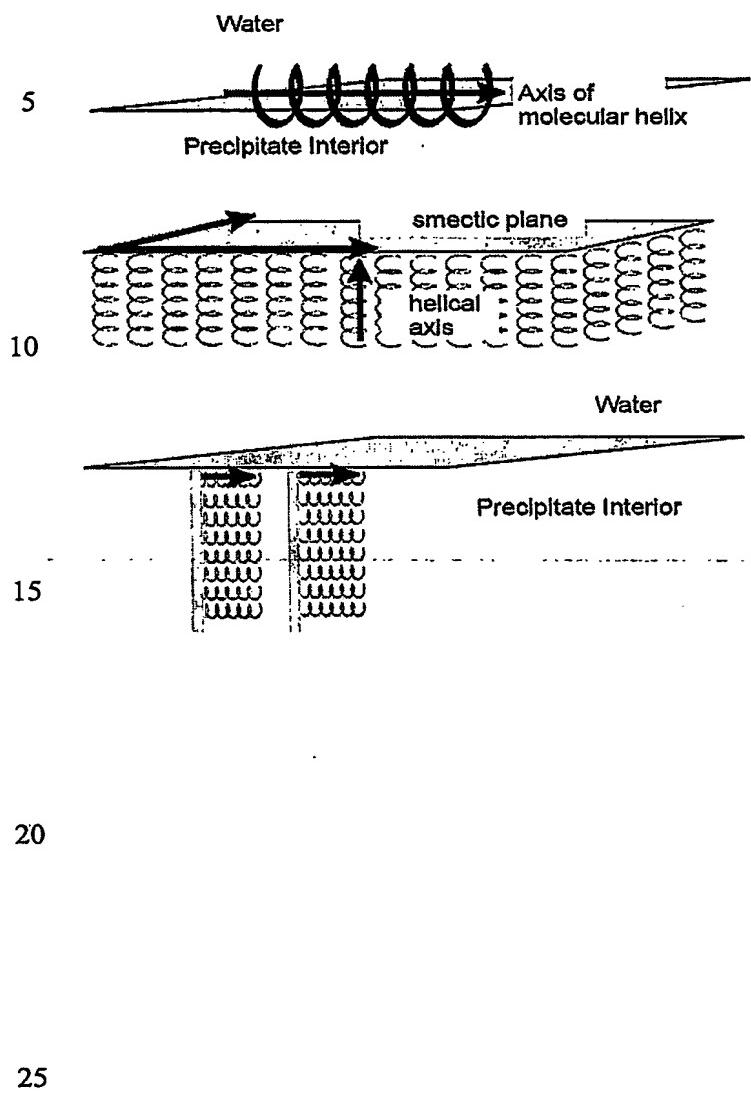
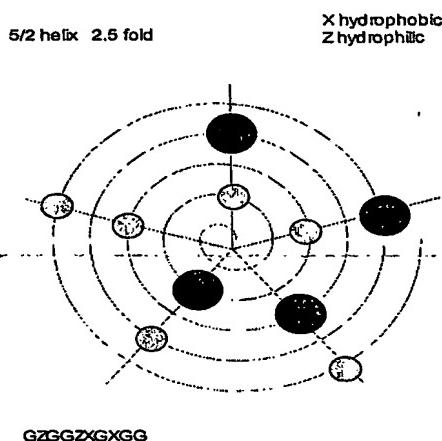
**Figure 29**

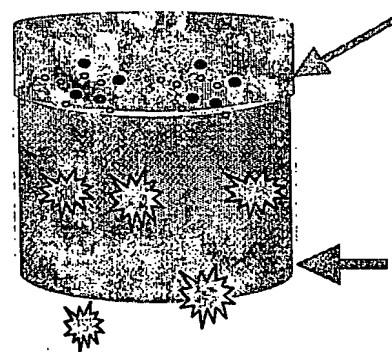
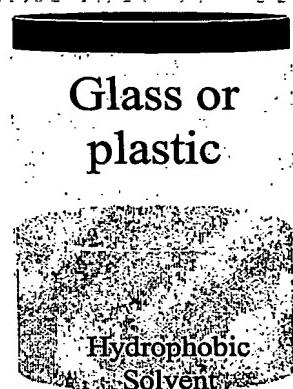
Figure 30



- A designed helix with a stronger hydrophobic/hydrophilic difference will be more readily stabilized and anchored parallel to the interface
- Helical axis is perpendicular to smectic layer plane
- Helices which tend to be parallel to interface and film result in layers more often normal to film

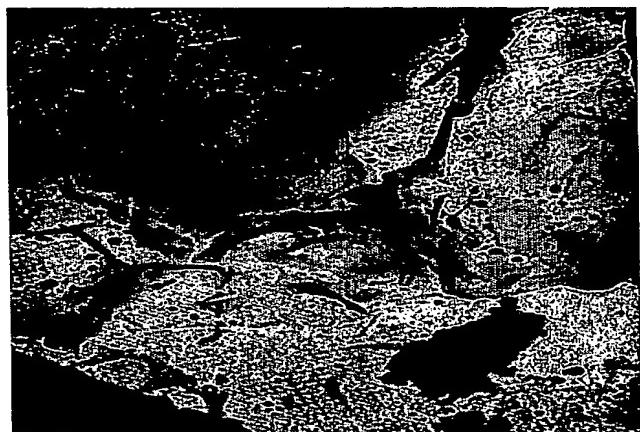
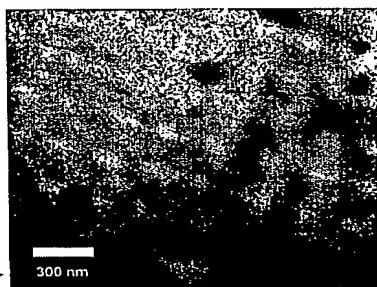
**Figure 31****Designed Amphiphilic Helix**

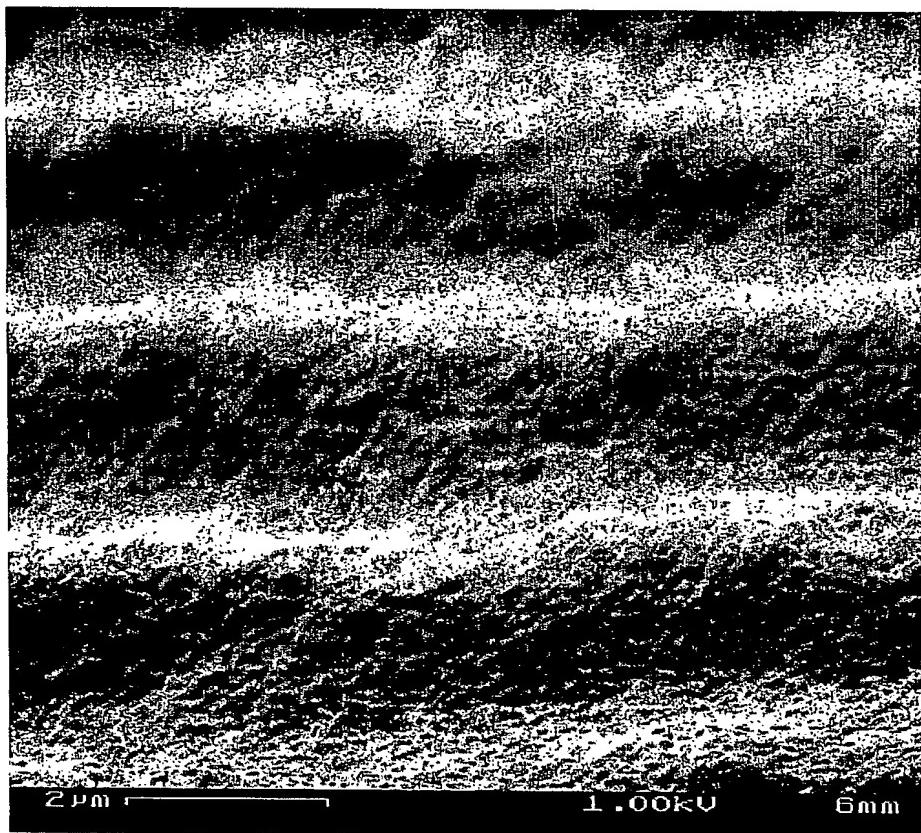
- Glycine
- Hydrophilic
- Hydrophobic
- 
- 



Interface –  
Molecules form  
Amphiphilic  
helix and orient



**Figure 32**

**Figure 33**

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